LBM Engineering, LLC

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CIVIL ENGINEERING - LAND DEVELOPMENT - SITE PLANS - STORMWATER MANAGEMENT

STORMWATER MANAGEMENT REPORT
9 MIDDLE HADDAM ROAD   July 27, 2021
EAST HAMPTON, CONNECTICUT

EXISTING CONDITIONS- The subject property is located in East Hampton Connecticut on the west side of Middle Haddam Road (CT Route 151), approximately 400 feet south of the intersection of Middle Haddam Road and West High Street (CT Route 66). The property has a paved driveway, a house and two barns. The property slopes toward Middle Haddam Road to the east with grades varying from 10% to 15%.

PROPOSED CONDITIONS- The proposal consists of converting the property to a veterinary clinic. The existing house will be renovated and expanded for the clinic with a paved driveway and parking area for the clients and a gravel parking area for the employees. The site will be served by municipal water and an on-site septic system. Proposed grading will not measurably change the existing drainage pattern. Stormwater runoff will continue to flow to Middle Haddam Road. Runoff from impervious surfaces (roof and pavement) will be directed to a drainage basin that will provide two functions: The basin will control the peak rate of runoff to below the undeveloped condition and the basin will hold and treat the runoff from a one-inch storm.

The basin reduces the peak rate of runoff to at or below the undeveloped condition by metering the water through a filter/underdrain. Peak rates of runoff from 0.26 acres of grass is compared to 0.26 acres of roof/pavement is as follows:
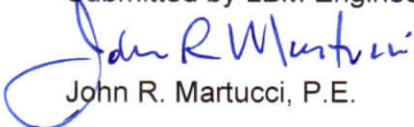
Storm Event	25 Yr.	50 Yr.	100 Yr.
Undeveloped	0.38 CFS	0.44 CFS	0.51 CFS
Proposed	0.28 CFS	0.29 CFS	0.66 CFS

The drainage basin is designed to treat the Water Quality Volume (WQV). The Water Quality Volume (WQV) is the volume of runoff from impervious surfaces generated by a one-inch storm. The calculated WQV is 897 cubic feet. The basin's volume is 1,248 cubic feet below elevation 180.0. The basin will provide water quality improvement and infiltration by filtering the runoff through a filter/underdrain.

CONCLUSION – The proposal will not have adverse effects on downstream properties or the storm drains in Route 151 and will not increase peak rates of runoff off-site. The proposal is in keeping with the policies and goals of the East Hampton Planning and Zoning Commission.

Drainage area maps and calculations are attached.

Submitted by LBM Engineering, LLC

John R Martucci

John R. Martucci, P.E.

DRAINAGE AREA MAP

* AREA MEASURED IN ACAD.
(THIS MAP NOT TO SCALE)

* 11,000 SF (0.26 AC)
NEW IMPERVIOUS AREA
TO BASIN

DRAINAGE BASIN

LEGEND

	UTILITY POLE
	PROPERTY ANGLE POINT
	C.H.D. MONUMENT (AS NO
	STONE WALL
	SIGN (AS NOTED)
	DRILL HOLE (AS NOTED)
	IRON PIN (AS NOTED)
	SILT FENCE

N/F
WILLIAM J. REESE &
SUSAN E. JOSEPH

PROPOSED PAVED PARKING AREA

PROPOSED GRAVEL PARKING AREA
(EMPLOYEES ONLY)

EXISTING BARN

2 OF 10

1EX

EXISTING

3S

IMPERVIOUS

4P

POND 1

Subcat Reach Pond Link

Summary for Subcatchment 1EX: EXISTING

Runoff   =   0.38 cfs @   0.25 hrs, Volume=   518 cf, Depth= 0.55"

Runoff by Rational method, Rise/Fall=1.0/2.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
CT_NEReg 25-yr Duration=15 min, Inten=4.88 in/hr

Area (ac)	C	Description	Land Use
0.260	0.30	GRASS	Meadow
0.260		100.00% Pervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0					**Direct Entry, GRASS - SLOPED**

Summary for Subcatchment 3S: IMPERVIOUS

Runoff   =   1.22 cfs @   0.17 hrs, Volume=   1,458 cf, Depth= 1.55"

Runoff by Rational method, Rise/Fall=1.0/2.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
CT_NEReg 25-yr Duration=15 min, Inten=4.88 in/hr

Area (ac)	C	Description	Land Use
0.260	0.95	Roof and pavement	Pavement
0.260		100.00% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry, IMPERVIOUS**

Summary for Pond 4P: POND 1

Inflow Area =		11,326 sf,100.00% Impervious, Inflow Depth =	1.55"	for 25-yr event	
Inflow	=	1.22 cfs @ 0.17 hrs, Volume=		1,458 cf	
Outflow	=	0.28 cfs @ 0.51 hrs, Volume=		1,442 cf, Atten= 77%, Lag= 20.1 min	
Primary	=	0.28 cfs @ 0.51 hrs, Volume=		1,442 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Peak Elev= 79.78' @ 0.51 hrs Surf.Area= 817 sf Storage= 1,061 cf

Plug-Flow detention time= 41.1 min calculated for 1,437 cf (99% of inflow)
Center-of-Mass det. time= 41.2 min (56.8 - 15.6)

Volume	Invert	Avail.Storage	Storage Description
#1	78.00'	2,261 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

EAST HAMPTON VET 2
Prepared by LBM Engineering LLC
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CT_NEReg 25-yr Duration=15 min, Inten=4.88 in/hr
Printed 7/27/2021
Page 3

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
78.00	386	0	0
79.00	618	502	502
80.00	873	746	1,248
81.00	1,154	1,014	2,261

Device	Routing	Invert	Outlet Devices
#1	Primary	78.00'	**3.0" Round Culvert** L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 78.00' / 77.00' S= 0.0500 '/' Cc= 0.900 n= 0.012, Flow Area= 0.05 sf
#2	Primary	80.00'	**3.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Primary OutFlow Max=0.28 cfs @ 0.51 hrs HW=79.78' (Free Discharge)
├—**1=Culvert** (Barrel Controls 0.28 cfs @ 5.77 fps)
└—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

EAST HAMPTON VET 2
Prepared by LBM Engineering LLC
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CT_NEReg 50-yr Duration=15 min, Inten=5.56 in/hr
Printed 7/27/2021
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Summary for Subcatchment 1EX: EXISTING

Runoff   =   0.44 cfs @   0.25 hrs, Volume=   590 cf, Depth= 0.63"

Runoff by Rational method, Rise/Fall=1.0/2.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
CT_NEReg 50-yr Duration=15 min, Inten=5.56 in/hr

Area (ac)	C	Description	Land Use
0.260	0.30	GRASS	Meadow
0.260		100.00% Pervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0					**Direct Entry, GRASS - SLOPED**

Summary for Subcatchment 3S: IMPERVIOUS

Runoff   =   1.38 cfs @   0.17 hrs, Volume=   1,662 cf, Depth= 1.76"

Runoff by Rational method, Rise/Fall=1.0/2.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
CT_NEReg 50-yr Duration=15 min, Inten=5.56 in/hr

Area (ac)	C	Description	Land Use
0.260	0.95	Roof and pavement	Pavement
0.260		100.00% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry, IMPERVIOUS**

Summary for Pond 4P: POND 1

Inflow Area =   11,326 sf,100.00% Impervious, Inflow Depth = 1.76"   for 50-yr event
Inflow   =   1.38 cfs @   0.17 hrs, Volume=   1,662 cf
Outflow   =   0.29 cfs @   0.51 hrs, Volume=   1,643 cf, Atten= 79%, Lag= 20.5 min
Primary   =   0.29 cfs @   0.51 hrs, Volume=   1,643 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Peak Elev= 79.99' @ 0.51 hrs Surf.Area= 871 sf Storage= 1,240 cf

Plug-Flow detention time= 45.0 min calculated for 1,637 cf (99% of inflow)
Center-of-Mass det. time= 45.1 min (60.8 - 15.6)

Volume	Invert	Avail.Storage	Storage Description
#1	78.00'	2,261 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

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EAST HAMPTON VET 2
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CT_NEReg 50-yr Duration=15 min, Inten=5.56 in/hr
Printed 7/27/2021
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Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
78.00	386	0	0
79.00	618	502	502
80.00	873	746	1,248
81.00	1,154	1,014	2,261

Device	Routing	Invert	Outlet Devices
#1	Primary	78.00'	**3.0" Round Culvert** L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 78.00' / 77.00' S= 0.0500 '/' Cc= 0.900 n= 0.012, Flow Area= 0.05 sf
#2	Primary	80.00'	**3.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Primary OutFlow Max=0.29 cfs @ 0.51 hrs HW=79.99' (Free Discharge)
├─**1=Culvert** (Barrel Controls 0.29 cfs @ 6.01 fps)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

EAST HAMPTON VET 2
Prepared by LBM Engineering LLC
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CT_NEReg 100-yr Duration=15 min, Inten=6.44 in/hr
Printed 7/27/2021
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Summary for Subcatchment 1EX: EXISTING

Runoff   =   0.51 cfs @   0.25 hrs, Volume=   684 cf, Depth= 0.72"

Runoff by Rational method, Rise/Fall=1.0/2.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
CT_NEReg 100-yr Duration=15 min, Inten=6.44 in/hr

Area (ac)	C	Description	Land Use
0.260	0.30	GRASS	Meadow
0.260		100.00% Pervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0					**Direct Entry, GRASS - SLOPED**

Summary for Subcatchment 3S: IMPERVIOUS

Runoff   =   1.60 cfs @   0.17 hrs, Volume=   1,925 cf, Depth= 2.04"

Runoff by Rational method, Rise/Fall=1.0/2.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
CT_NEReg 100-yr Duration=15 min, Inten=6.44 in/hr

Area (ac)	C	Description	Land Use
0.260	0.95	Roof and pavement	Pavement
0.260		100.00% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry, IMPERVIOUS**

Summary for Pond 4P: POND 1

Inflow Area =   11,326 sf,100.00% Impervious, Inflow Depth = 2.04"   for 100-yr event
Inflow   =   1.60 cfs @   0.17 hrs, Volume=   1,925 cf
Outflow   =   0.66 cfs @   0.45 hrs, Volume=   1,904 cf, Atten= 59%, Lag= 16.6 min
Primary   =   0.66 cfs @   0.45 hrs, Volume=   1,904 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Peak Elev= 80.13' @ 0.45 hrs Surf.Area= 908 sf Storage= 1,359 cf

Plug-Flow detention time= 42.8 min calculated for 1,898 cf (99% of inflow)
Center-of-Mass det. time= 42.9 min (58.5 - 15.6)

Volume	Invert	Avail.Storage	Storage Description
#1	78.00'	2,261 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
78.00	386	0	0
79.00	618	502	502
80.00	873	746	1,248
81.00	1,154	1,014	2,261

Device	Routing	Invert	Outlet Devices
#1	Primary	78.00'	**3.0" Round Culvert** L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 78.00' / 77.00' S= 0.0500 '/' Cc= 0.900 n= 0.012, Flow Area= 0.05 sf
#2	Primary	80.00'	**3.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Primary OutFlow Max=0.66 cfs @ 0.45 hrs HW=80.13'   (Free Discharge)
┬─**1=Culvert** (Barrel Controls 0.30 cfs @ 6.15 fps)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 0.36 cfs @ 0.95 fps)

COMPUTATIONS FOR:						Project	
WATER QUALITY FLOW / WATER QUALITY VOLUME						Made By:	JRM
9 MIDDLE HADDAM ROAD						Date:	7/26/2021
EAST HAMPTON, CT						Rev:	
						Date:	

IN SYSTEM TO WATER QUALITY BASIN

ConnDOT Drainage Manual Ch. 10 and Ch. 11, Appendix C

Contributing Basins	Wooded Area (acres)	Grass Area (acres)	Paved Area (acres)	Total Area (acres)
system	0	0	0.26	0.26
Total	0	0	0.26	0.26

Equation 10.31: WQV = (1")(R)(A)/12 = 0.021 acre-feet or 897 cubic-feet

I = % of Impervious Cover = 100%

1,248 CF Provided

R = volumetric runoff coeff. 0.05 + 0.009(I) = 0.9500

A = site area (acres) = 0.26 acres = 0.0004 miles^2

Q = runoff depth (in watershed inches) = [WQV(acrefeet)]*[12(inches/foot)]/drainage area (acres)

Q = 0.95

$CN = 1000 / [10 + 5P + 10Q - 10(Q^2 + 1.25QP)^{0.5}]$ = 99.6

P = design precipitation (1" for water quality storm) = 1 inch

Q = runoff depth (in watershed inches)

t_c 10 min

t_c = 10 minutes = 0.167 hours

From Table 4-1, Ia = 0.041 Ia/P = 0.041

From Exhibit 4-III, q_u = 700

WQF = (qu)(A)(Q) = 0.27 cfs